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THE LUNAR LANDER NEUTRON & DOSIMETRY (LND) EXPERIMENT ON CHANG'E4

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Chang'E4, the next Chinese mission to the Moon, is planned to launch in December 2018 and to land on the far side of the Moon in the South Pole Aitken Basin. The mission consists of a lander, a rover, and a communication relay around the Earth-Moon L2 libration point. Here we describe the Lunar Lander Neutron Dosimetry experiment (LND) on the lander. It consists

of a stack of 10 segmented Si solid-state detectors (SSDs) which forms a particle telescope to measure charged particles (electrons 150-500 keV, protons 12-30 MeV, and heavier nuclei 15-30 MeV/nuc). A special geometrical arrangement allows observations of fast neutrons (and g-rays) which are also important for dosimetry and cosmic-ray exposure of lunar soils. Thermal neutrons are measured using a very thin Gd conversion foil which is sandwiched between two SSDs. Thermal neutrons are sensitive to subsurface water and important to understand lunar surface mixing processes. Despite the aim of landing humans on the Moon in the not too distant future, radiation measurements in the vicinity of the Moon are remarkably scarce. Fairly recent measurements in lunar orbit were provided by the Radiation Dose Monitor (RADOM) on board Chandrayaan-1. The spacecraft reached its operational 100 km circular orbit on November 12, 2008. Measurements showed a dose rate of 0.23 mGy per day averaged over 3545 hours of measurement time (20/11/2008 to 18/5/2009). Newer measurements have been provided by the Cosmic Ray Telescope for the Effects of Radiation (CRaTER) instrument on board the Lunar Reconnaissance Orbiter (LRO). CRaTER measured a radiation exposure of about 0.22 0.27 mGy per day in its 50 km orbit. In comparison with these meager orbital data, there is a real dearth of data on the lunar surface. The current knowledge about the radiation environment on the surface of the Moon is based exclusively on calculations using radiation transport models with input parameters from models for the galactic cosmic ray spectra and for solar particle events. This is highly questionable, especially since we know that these models are fraught with uncertainties. Thus LND will provide the first active dosimetry measurements on the surface of the Moon. In this presentation we will discuss the science, implementation, and status of LND on China's Chang'E4 mission.